USDA SUMMARY REPORT

MINNESOTA RIVER BASIN

PREPARED BY:

SOIL CONSERVATION SERVICE

FOREST SERVICE

ECONOMICS, STATISTICS, AND
COOPERATIVES SERVICE

APRIL 1978

A D D E N D U M

USDA Summary Report - Minnesota River Basin

This Addendum shows the project cost, benefits, and benefit-cost ratio based on 6 5/8 percent interest rate, 1977 installation costs, and 1977 normalized prices for agricultural commodities. Annual project costs, benefits and benefit-cost ratio are as follows:

1. Project costs are $3,600,200 1/
2. Project benefits are $4,953,600
3. The project benefit-cost ratio is 1.4:1

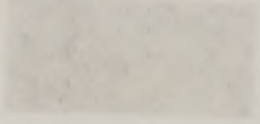
1/ Average Annual Cost

PREFACE

The Minnesota River Basin Report was published by the Southern Minnesota River Basin Commission in February 1977. The Commission report addresses the basin's complex water and related land resource issues by describing the problems, needs, and the development potential, and outlines a plan for the development of the basin. However, the report does not contain cost and benefit data, National Economic Development, Environmental Quality, Regional Development, and Social Well-being accounts data, environmental impact summary, etc., as required by the Water Resource Council's (WRC) Principles and Standards. This USDA Summary Report is prepared to supply this information. Complete information is not available for all aspects of USDA proposals. This is noted in the accounts display and throughout the report where applicable.

This report is limited to a concise summary of the data in the Commission report, with special emphasis on items of direct concern to USDA. It is suggested that reference be made to the Commission report for detailed information on items of special concern. A copy of the Commission report may be obtained by making a request to the Southern Minnesota River Basin Commission - Space Center, 444 Lafayette Rd. - St. Paul, Minnesota 55101.

The actions listed as alternatives should be considered as opportunities for development. The Commission report is not designed to provide all the information necessary for implementation of specific projects. It does provide a framework of compatible actions which can be implemented as programs and/or resources become available and when local support is evident. Should local decisions lead to implementation studies, involving Federal assistance, WRC regulations will be complied with in developing the implementation plan.



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CHAPTER I

Introduction

A. Purpose of USDA Summary Report

The Minnesota River Basin Report published by the Southern Minnesota River Basin Commission, does not contain cost and benefit data, required Principles and Standards account data, and an environmental impact summary. This USDA Summary Report is being published to provide this information for the recommended USDA program measures. The benefit information was updated using the U.S. Water Resources Council prices published in the Agricultural Price Standards - October 1976. Cost information was updated using price increases of construction and other cost as set forth by the March 24, 1977 issue of the Engineering News Record.

B. Study Background

In June 1972 the Upper Mississippi River Basin Coordinating Committee submitted the complete Upper Mississippi River Comprehensive Basin Study to the United States Water Resources Council. The report contained a summary of problem areas recommended for further study. The Minnesota River Basin was one of the areas identified as having major water and related land resource problems. It was recommended that a regional or river basin plan be coordinated by a river basin commission responsible for focusing on middle term needs and desires. These recommendations confirmed the need for the Cooperative River Basin Study (Type IV) already being conducted.

During the 1971 Minnesota Legislative Session, the Southern Minnesota River Basin Commission (SMRBC) was created and charged with developing and implementing a comprehensive environmental conservation and development plan for the Minnesota River Basin.

Under congressional authority, the USDA was provided funds to begin study of the Minnesota River Basin in July 1970. The Secretary of Agriculture designated the Soil Conservation Service (SCS) to provide leadership in carrying out the Department's responsibilities in conducting the study. The Forest Service (FS) and the Economics Statistics and Cooperative Service (ESCS) participated under provisions of a Memorandum of Understanding dated April 15, 1968. USDA personnel were guided by a Field Advisory Committee (FAC), which consisted of a representative from each SCS, ERS, and FS. All activities were reviewed at FAC meetings and SMRBC meetings. Specific investigations, inventories, and findings were reviewed with local policy committees.

The basin plan (Chapter VIII of the Commission Report) was developed by the SMRBC, with technical guidance furnished by the USDA planning staff personnel. The Commission Report was published and distributed by the SMRBC.

C. Nature and Intensity of Investigations

The basin was divided into four study areas for investigative purposes. Local policy committees were formed under SMRBC guidance in each study area. These policy committees provided local input and guidance on investigations in their respective areas.

Investigations in each study area were completed in two phases. Phase I consisted of identifying problems and needs and inventorying the natural resources. Phase II activities consisted of specific investigations designed to formulate alternative solutions, analyze these alternatives, and recommend the most feasible solutions.

Information from previous studies and various Federal, State, and private sources was used to the extent possible. In collecting data, questionnaires and inventory forms were completed by policy committees, State agencies, interested citizens, and SCS district conservationists. Field trips by USDA river basin staff members were made in all counties. The USDA 1967 Conservation Needs Inventory was updated for those counties in Minnesota, Iowa, and South Dakota and established the basis for determining conservation treatment needs and land use. The ESCS collected data and made projections regarding population, income, employment, and agricultural production.

D. Study Objective

The objective of USDA's participation in the study was to identify problems and develop alternatives for the orderly development of water and related land resources in upstream watersheds. This included development of data on the needs and potentials for:

1. Reduction of floodwater and sediment damage
2. Proper land treatment and management
3. Agricultural, municipal, and industrial water supply development
4. Water quality management
5. Recreation

6. Fish and wildlife habitat enhancement

7. Improved drainage of agricultural land

8. Environmental quality improvement

The basin-wide comprehensive water and related land resource plan was developed based on problems and needs identified by local people and local, regional, and State organizations. The Southern Minnesota River Basin Commission coordinated the input and based plan selection on alternative proposals developed by the U.S. Department of Agriculture.

E. Cooperating Agencies

The Secretary of Agriculture authorized the Soil Conservation Service to provide leadership in carrying out the USDA's responsibilities in conducting the study. The Forest Service and Economics Statistics and Cooperative Service participated under provisions of a Memorandum of Understanding dated April 15, 1968 (RB-2, Rev., date May 6, 1968). Valuable cooperation and assistance were provided by those Federal, State and local agencies listed in the acknowledgment section of the Commission report.

F. Report Uses

This report will be used by the State of Minnesota and USDA to:

1. Help formulate the Minnesota River Basin portion of the State land and water resource plan.
2. Assist USDA in making the most effective use of its ongoing land and water conservation development programs.

3. Serve as a guide in coordinating water and related land resource development programs and projects of local, State, and Federal agencies, and private groups and individuals.

4. Aid in setting priorities for water resources development within the Minnesota River Basin.

CHAPTER II

Environmental Setting and Basin Resources

A. Location

The Minnesota River Basin has an area of 16,770 square miles (10,732,000 acres) and includes all, or parts, of 37 counties in Minnesota, six counties in South Dakota, and three counties in Iowa (See Location Map). The basin is part of the Upper Mississippi Water Resource Region.

The basin was divided into the following four study areas: Study Area I - Blue Earth River, Study Area II - Upper Minnesota River, Study Area III - Headwaters Minnesota River, and Study Area IV - Middle and Lower Minnesota River.

B. Land Resource and Use

Agriculture is the primary industry in the basin. Of the total land area, cropland occupies 76 percent or 8,214,190 acres (See Tables 1 and 2).

The basin is located within portions of two major Land Resource Areas (LRA's): 102-Loess, Till and Sandy Prairies, and 103-Central Iowa and Minnesota Till Prairies.

The western half of the basin is primarily in LRA 102. It is dominated by Chernozem soils developed on calcareous loam till. Topography is

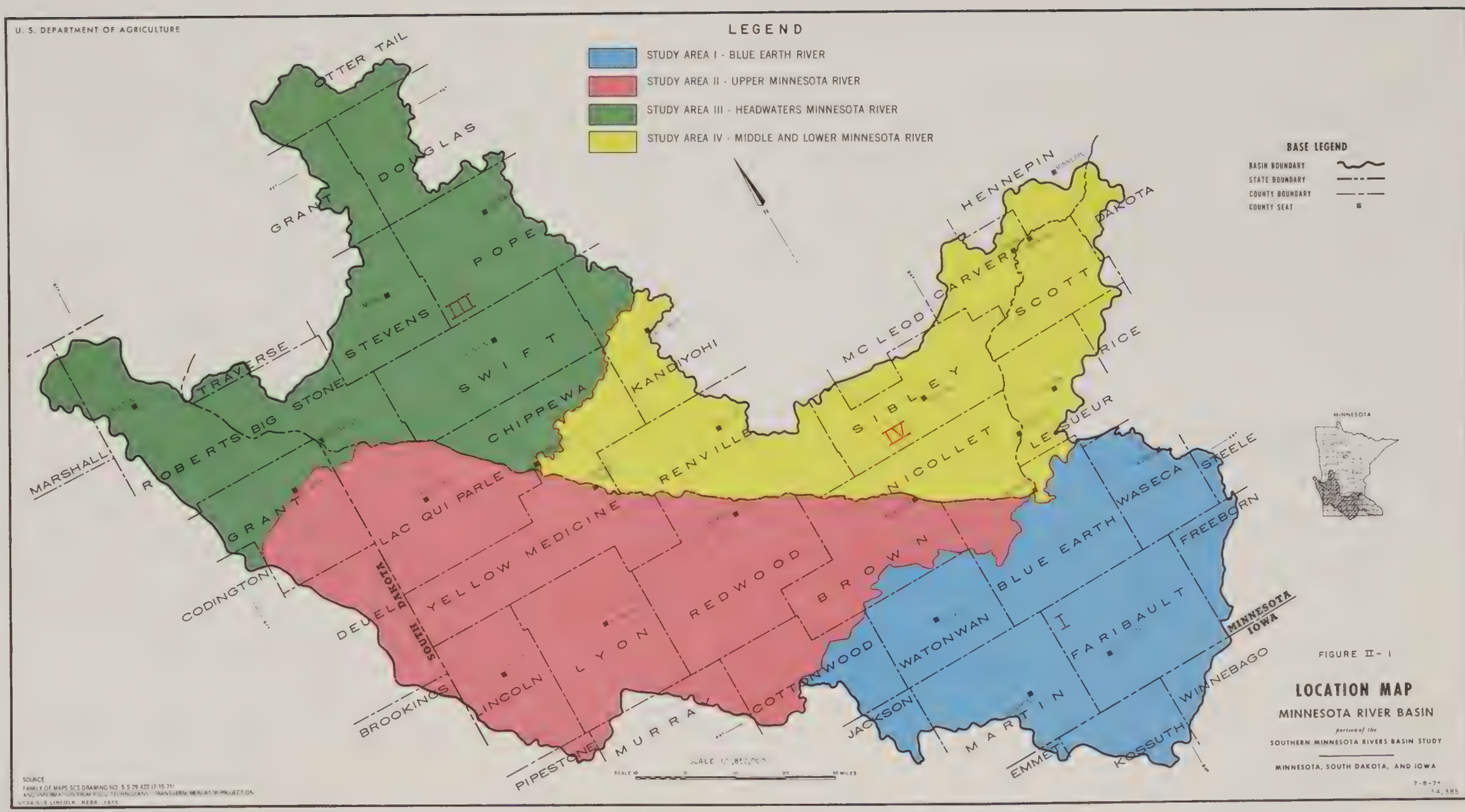

FIGURE II- 1

LOCATION MAP

MINNESOTA RIVER BASIN

portion of the

SOUTHERN MINNESOTA RIVERS BASIN STUDY

MINNESOTA, SOUTH DAKOTA, AND IOWA

7-8-74

14,385

TABLE 1. LAND USE (1974)[1], MINNESOTA RIVER BASIN

Use	Study Area I	Study Area II	Study Area III	Study Area IV	Total Basin
Cropland					
Acres	1,865,530	2,740,790	2,019,090	1,588,780	8,214,190
Percent	84	80	71	71	76
Pastureland					
Acres	68,370	303,040	355,680	146,610	873,700
Percent	3	9	13	6	8
Forest Land					
Acres	54,990	66,120	86,770	113,990	321,870
Percent	3	2	3	5	3
Other Land					
Acres	96,290	174,180	206,240	125,980	602,690
Percent	4	5	7	6	6
Non-Inventory					
Acres	139,720	141,400	177,860	260,610	719,590
Percent	6	4	6	12	7
TOTAL ACRES	2,224,900	3,425,530	2,845,640	2,235,970	10,732,040
Percent	100	100	100	100	100

[1]Adjusted 1967 Conservation Needs Inventory data.

TABLE 2. CROPS AND PERCENTAGES (1974)[1], MINNESOTA RIVER BASIN

Crop	Study Area I (Percent)	Study Area II (Percent)	Study Area III (Percent)	Study Area IV (Percent)	Total Basin (Percent)
Corn[2]	46	39	28	39	38
Soybeans	34	26	18	28	26
Oats	4	10	21	6	11
Pasture in Rotation	5	8	9	8	7
Alfalfa Hay	4	6	7	6	6
Small Grains[3]	2	5	10	3	5
Idle	2	3	4	6	4
Other	3	3	3	4	3
TOTAL	100%	100%	100%	100%	100%
Total Cropland Acres	1,865,530	2,740,790	2,019,090	1,588,780	8,214,190

[1]Crops and percentages for 1974 are based on the 1967 CNI data with adjustments estimated by USDA technicians for shifts in different crops.

[2]Corn includes both corn for grain and silage. Approximately 90 percent of corn grown is harvested as grain and 10 percent harvested as silage.

[3]Small grains are mainly spring wheat, barley, and flaxseed.

mostly undulating, but ranges from nearly level to hilly. Nearly all land is cultivated, corn, soybeans, and small grains being the prevalent crops. Water and wind erosion are serious problems; inadequate drainage is a problem on many soils.

The central and eastern portions of the basin are in LRA 103, which consists of Brunizem and Humic-Gley soils developed in calcareous loam and clay loam till. Topography ranges from nearly level to hilly, but is mostly undulating. Nearly all of the area is cultivated, corn and soybeans being the prevalent crops.

The eastern edge of the basin consists of Gray-brown Podzolic or Gray-brown Podzolic-Brunizem inter-grade soils developed from calcareous loam and clay loam till. Topography is undulating to rolling to steep. Most of the land is cultivated, corn, soybeans, hay, and small grains being the major crops. Erosion on the rolling and steep cropland is a serious problem. Lack of drainage associated with wet soils is also a problem.

The 1969 Census of Agriculture reported 33,906 farms in the basin with an estimated land and building investment of 3.5 billion dollars. The 1974 Census of Agriculture reported 29,925 farms and an estimated land and building investment of 4.8 billion dollars.

Most forest land in the basin is located along natural water courses. Trees are usually grown where it is unprofitable or impossible to produce agricultural crops. Forest land occurs on 3 percent of the area or 321,870 acres. Commercial forest land accounts for 91 percent of the

total forest land. Although 50 percent of the commercial forest land is rated poor, the basin does contain a good supply of saleable timber.

C. Land Capability Classes and Soil Resource Groups (SRG)

Table II-10 (in the Commission report) shows major land use by land capability class in the basin. About 93 percent of the basin land resource is in Classes I through IV, and is generally suited for cultivation with practical land treatment. Only 1.3 percent of the basin inventoried land has limitations precluding its use for commercial agricultural production.

Land in the basin is highly productive for agricultural crops. Seventy percent of the agricultural land is in the two most productive Soil Resource Groups (SRG). The most prevalent SRG contains 3.7 million acres of deep, medium to moderately fine textured upland soils. These soils are well-suited for corn and soybean production and will sustain high yields with proper management. The second largest Soil Resource Group contains 2.8 million acres of wet soils. When drained and properly managed, these soils are also excellent for crop production.

D. Wetlands

Wetlands of ten acres or larger (Types 2 - 6) within the Minnesota River Basin total approximately 215,000 acres. Additional wetlands of less than 10 acres in size are scattered throughout the basin (See Table II-8 of the Commission report). Table 3 gives a breakdown of wetland by types for each study area.

TABLE 3. SUMMARY OF WETLANDS 10 ACRES OR LARGER IN THE MINNESOTA RIVER BASIN[1]
(Minnesota Portion Only)

Wetland Types	Study Area I Acres	Study Area II Acres	Study Area III Acres	Study Area IV Acres	Total Acres
Dry or Drained Basins	18,348	29,593	8,953	17,618	74,512
Partially Drained Basins, Some Wetland Remains	2,926	1,964	2,817	6,640	14,347
Type 2	1,371	157	2,020	2,951	6,499
Type 3	3,377	4,201	13,654	9,000	30,232
Type 4	18,158	16,891	44,879	35,840	115,768
Type 5	8,430	9,374	15,831	12,241	45,876
Type 6	12	28	93	226	359
Unclassified	357	249	435	1,110	2,151
TOTAL WETLANDS	34,631	32,864	79,729	68,008	215,232

[1]Condensed from files of Minnesota Department of Natural Resources, Lake Survey Data. Adjusted to conform to Circular 39 - Type definitions.

Preservation and management of wetlands for wildlife has received top priority from State and Federal agencies concerned with the conservation and preservation of wildlife habitat areas. Total wetland area preserved or managed by State and Federal agencies is approximately 64,000 acres.

E. Water Resource

More than three percent of the basin is lakes, wetlands, or streams. The basin includes 330 miles of the Minnesota River main stem, 385 miles of major tributary streams, and 2,500 lakes. Most of the lakes are shallow

with maximum depths generally not more than 15 feet. Water storage in the 2,500 lakes exceeds one million acre feet, or more than one inch of runoff for every acre in the basin. This storage is equivalent to 25 percent of the average annual runoff.

Ground water is available from glacial sand and gravel aquifers and sedimentary bedrock aquifers (See Figure II-9 in the Commission report). The average thickness of the glacial till is 200 feet. Depth to the ground water table is generally less than 100 feet. Average yield from glacial outwash deposits is about 500 gpm.

F. Fish, Waterfowl and Wildlife

A variety of wildlife species are found throughout the basin. Habitat quantity and quality are major factors which control population and distribution. Excellent habitat is provided on approximately 142,000 upland acres which are included within State and Federal management areas, generally in association with wetlands. Windbreaks, roadside ditches, and scattered natural areas provide additional upland habitat.

Fish lakes total 160,000 acres (See Table II-14 of the Commission report). Many of these are shallow, fertile, and classified as rough fish lakes. Fifty-seven percent of the basin's lake area is in Study Area III, which also includes 65 percent of all the lakes classified as game fish lakes. The quality of fish habitat has decreased due to accelerated eutrophication of water bodies. Such eutrophication results from nutrient-rich runoff from agricultural land, plus urban and industrial areas. (See Chapter

II, of the Commission report for detailed information on fish and wildlife in the basin.)

G. Recreation

Outdoor recreation opportunities within the basin are many and varied. Study Area III, which has most of the lakes, provides the largest share of facilities for waterbased recreation activities. Recreation trails, golf courses, tennis courts, picnic grounds, and swimming pools are most numerous in Study Area IV, which is closest to the urban population.

At present, most facilities are not adequate to meet current and projected demand when acceptable space standards are applied. (Refer to Chapters IV and V of the Commission report for more information on recreation problems and potential.)

H. Economic Resources

Opportunities for economic development in the basin are determined by the basin's natural resources, environment, and present and future economic conditions. Continued economic growth and higher standards of living are goals of resource planning. The need for resource development is assessed by comparing the resources necessary for desired future condition with resources available to meet those conditions without further development.

The projections of economic base for the Minnesota River Basin represent a disaggregated share of two national projection alternatives. The two

alternatives relate to the national OBERS Series C and E' population projections and include projections of population, employment, incomes, and industrial earning. Of major importance are projections of agricultural output associated with the population projections and alternative levels of agricultural export.

1. Population

Population trends in the basin are similar to those of most of rural America. Over the past two decades, the total population has remained quite stable, decreases in rural population being offset by increases in the larger urban centers.

Present and projected population for Series C and E' alternatives are shown in Table 4.

Total population in the basin is projected to increase under both alternatives. An increase of about 9 percent every decade is projected in the Series C alternative and a 4.5 percent increase every decade is projected in the Series E' alternative. A continued decrease in the rural farm population is projected, but at a lower rate than in the past.

2. Labor Force, Employment, and Income

About 38 percent of the basin's 1970 population were participants in the labor force. Unemployed workers accounted for 5.3 percent of the civilian labor force. Changes in the labor force have resulted from increased

TABLE 4. POPULATION PROJECTIONS, SERIES C AND SERIES E' ALTERNATIVES, MINNESOTA RIVER BASIN, 1970-2020

Year (Alternative)	Study Area I	Study Area II	Study Area III	Study Area IV	Total Basin
1970	127,495	121,796	79,836	143,567	472,694
1980 (Series C)	141,528	121,164	74,836	171,564	509,092
1980 (Series E')	134,001	122,540	75,686	155,483	487,710
2000 (Series C)	168,945	228,505	62,595	257,672	717,717
2000 (Series E')	148,072	128,288	74,200	198,816	549,376
2020 (Series C)	209,810	139,873	73,618	312,875	736,176
2020 (Series E')	163,576	138,148	72,710	213,771	588,205

TABLE 5. CIVILIAN LABOR FORCE BY MAJOR INDUSTRY CLASSIFICATION AND ECONOMIC STUDY AREAS, 1970

Employment Classification	Study Area I	Study Area II	Study Area III	Study Area IV	TOTAL Basin
Agriculture, Forestry, Fisheries	7,404	10,914	7,642	9,090	35,050
Mining	61	39	69	147	316
Construction	2,579	2,413	1,444	3,570	10,006
Manufacturing, All	8,721	5,406	1,828	12,394	28,349
Food and Kindred Products	2,174	2,031	432	2,668	7,305
Textile and Fabricated Textile Products	274	173	19	527	993
Furniture, Lumber, and Wood	142	55	5	352	554
Printing, Publishing and Allied	1,179	462	203	551	2,395
Chemicals and Allied Products	90	57	19	267	433
Metal Industries	635	166	86	1,043	1,930
Machinery and Supplies	2,551	1,160	452	3,493	7,656
Transportation Equipment	343	184	64	517	1,108
Other Manufacturing	1,333	1,118	548	2,976	5,975
Transportation Commission and Public Utilities	2,290	1,918	1,270	2,424	7,902
Wholesale and Retail Trade	11,253	9,604	5,364	10,253	36,474
Finance, Insurance, Real Estate	1,462	1,285	807	1,580	5,134
Services, Excluding Public School	8,656	7,775	4,501	9,170	30,102
Public Schools and Colleges	3,677	2,631	1,978	2,803	11,089
Public Administration	1,254	1,267	1,050	1,350	4,921
Total Employment	47,357	43,252	25,953	52,781	169,343
Unemployment	2,589	1,645	3,085	2,124	9,443
Labor Force	49,946	44,897	29,038	54,905	178,786

Source: 1970 Census of Population, Bureau of Census, U.S. Department of Commerce.

participation rates, especially for women, as well as changes in the population from natural increases or decreases and migration.

In 1970, family and per capita income in the basin lagged behind the State average, as indicated in Table 6. The 1970 per capita income of $2,571 was 15 percent lower than the State average. In that same year, 13.3 percent of the families in the basin had incomes under $3,000, 13.6 percent had incomes of $3,000 - $5,000 and approximately 13.7 percent had incomes exceeding $15,000. See Table 6 for more information on income for specific occupations.

3. Major Types of Economic Activity

Industry types are reported in two categories - basic and nonbasic. The basic industries include agriculture, manufacturing, mining, and forestry. The nonbasic industries include construction, transportation, retailing, wholesaling, and all services. Basic industries have a special importance in an economy because they bring in new money which in turn stimulates additional economic activity.

In 1970, 35 percent of the labor force was employed in basic industries and 65 percent in nonbasic industries. One in every five workers was employed in agriculture, forestry, or fisheries. See Table 5 for a breakdown of the labor force by major industry classification and study area.

The projections of industrial earnings for basic and nonbasic industries for the two growth alternatives are shown in Table 7. Total earning is expected to grow 4.3 percent in the Series C alternative and 3.5 percent in the Series E' alternative.

TABLE 6. MEAN ANNUAL FAMILY AND PER CAPITA INCOME AND EARNINGS PER WORKER BY OCCUPATION, MINNESOTA RIVER BASIN, 1970

	Study Area I	Study Area II	Study Area III	Study Area IV	Basin	Minnesota
			Dollars			
Family Mean Income	9,922	8,693	8,300	10,205	9,405	11,098
Per Capita Income	2,758	2,414	2,337	2,670	2,571	3,052
Mean Earnings, All Employed Males	7,131	6,415	6,543	7,341	6,930	8,165
Mean Earnings, All Employed Females	2,802	2,605	2,520	2,223	2,533	3,330
Professional, Managerial and Kindred Workers[1]	10,459	10,067	9,776	11,146	10,498	12,000
Craftsmen, Foremen and Kindred Workers[1]	6,957	6,469	5,928	7,789	7,029	8,269
Operatives, including Transport[1]	5,900	5,652	5,311	6,337	5,954	6,596
Laborers, except Agricultural[1]	3,856	3,739	3,792	5,086	4,256	4,741
Farmers and Farm Managers[1]	7,352	5,784	6,691	5,907	6,348	5,583
Farm Laborers, except Foremen and Unpaid Labor[1]	2,754	2,522	2,482	2,966	2,705	2,777
Clerical and Kindred Workers[2]	2,740	2,616	2,445	2,961	2,749	3,411

Source: 1970 Census of Population, Bureau of Census, U.S. Department of Agriculture.

[1]Includes only male workers.

[2]Includes only female workers.

TABLE 7. PROJECTED INDUSTRIAL EARNINGS FOR THE MINNESOTA RIVER BASIN

SERIES C AND SERIES E' ALTERNATIVES, 1970 - 2020

	1970	1980		2000		2020	
		Series C	Series E'	Series C	Series E'	Series C	Series E'
		1967 Dollars in Thousands					
Basic Industries	443,700	579,575	609,960	1,039,978	1,012,443	2,171,454	1,622,662
Agriculture & Forestry	291,100	322,539	339,956	429,166	478,137	788,277	679,781
Mining	1,800	4,672	4,277	7,524	5,222	12,400	6,460
Manufacturing	145,800	252,364	265,738	603,288	529,084	1,370,777	936,241
Food & Kindred	49,700	80,252	84,987	155,268	123,749	287,562	177,713
Machinery	43,000	73,690	61,900	191,520	143,257	467,385	273,888
Other Manufacturing	53,100	98,422	118,851	256,500	262,078	615,830	484,640
Nonbasic Industries	467,300	948,425	856,475	2,380,022	1,872,895	5,579,546	3,514,098
Construction	50,100	100,133	86,266	208,620	155,584	391,591	251,267
Transportation, Communication, & Utilities	30,000	49,559	49,757	99,864	102,860	205,402	185,889
Wholesale & Retail Trades	136,700	269,933	246,990	641,934	493,005	1,466,489	874,027
Finance, Insurance & Real Estate	22,800	31,790	29,777	108,800	83,820	224,990	153,353
Other Services	100,200	183,611	190,772	428,184	433,322	939,421	817,296
Government	127,500	313,399	252,913	892,620	604,304	2,351,653	1,232,266
Total Industry Earnings	911,000	1,528,000	1,466,435	3,420,000	2,885,338	7,751,000	5,136,580

4. Agricultural Production

The climate and soil conditions in the basin are favorable to the production of most food and feed grains. Corn and soybeans are the primary field crops and are grown throughout the basin. Minnesota ranks third in the nation in total corn production, the Minnesota River Basin producing 4.4 percent of the national production. The 40 million bushels of soybeans currently raised in the basin represent over half of Minnesota's production and about 3.6 percent of national production. Over half of all cropland in the basin is used to grow corn or soybeans; 64 percent of the value of all crops is from corn and soybeans.

The production of forage crops to support livestock operation is important, especially in Study Areas II and III. Nearly 20 percent of total cropland is used for production of silage, hay crops, and pasture. In addition, some 870,000 acres of permanent pasture and 165,000 acres of forest lands are grazed.

Livestock production accounts for two-thirds of all farm product sales, sale of cattle and hogs being most important. Tables 8 and 9 report the current normal and alternative projected volumes and values of the basin's agricultural output.

5. Agricultural and Nonagricultural Land Use Projections

The projected economic activity and population growth in the basin will affect the basin's future land uses. Increased acreage will be required for home sites, services, industrial areas, parks, and transportation

TABLE 8. CURRENT NORMAL AND PROJECTED PRODUCTION AND VALUE OF AGRICULTURAL OUTPUT, SERIES E' ALTERNATIVE,[1] MINNESOTA RIVER BASIN

	Units	Current Normal Production	Current Normal Dollar Value	1980 Production	1980 Dollar Value	2000 Production	2000 Dollar Value	2020 Production	2020 Dollar Value
			($000)		($000)		($000)		($000)
Crops									
Corn	bu	201,258	303,900	285,074	430,462	404,094	610,182	457,579	690,944
Soybeans	bu	40,464	166,712	82,912	341,597	113,410	467,249	122,506	504,725
Oats	bu	46,603	34,952	44,067	33,050	66,601	49,951	77,539	58,154
Wheat	bu	4,790	11,975	7,051	17,627	8,899	22,248	10,121	25,303
Rye	bu	1,548	1,734	683	765	466	522	-	-
Barley	bu	1,764	2,223	1,264	1,593	1,044	1,315	674	849
Flax	bu	4,050	17,901	2,391	10,568	1,073	4,743	521	2,303
Hay	T	1,603	40,953	1,620	39,920	1,890	46,573	2,100	51,748
Alfalfa Hay	T	1,448	37,996						
Other Hay	T	155	2,957						
Silage	T	4,093	39,047	4,227	38,888	4,788	44,050	5,110	47,012
Sugarbeets	T	525	9,970	769	14,611	847	16,093	952	18,088
Irish Potatoes	CWT	175	410	247	577	332	776	387	904
Vegetables	CWT	5,475	10,402	8,421	15,999	11,210	21,298	13,233	25,141
Pasture	AUD [2]	171,555	61,416	167,062	59,807	192,035	68,748	202,329	72,433
Livestock									
Beef & Veal	lbs	549,000	188,307	649,402	222,745	797,557	273,562	848,557	291,055
Pork	lbs	533,250	150,430	678,109	191,227	763,842	215,403	792,205	223,402
Lamb & Mutton	lbs	11,093	3,892	6,659	2,337	5,230	1,835	6,918	2,428
Chickens	lbs	30,250	6,231	17,952	3,662	11,599	2,366	7,150	1,459
Broilers	lbs	1,978	403	4,095	835	8,414	1,716	13,638	2,782
Turkeys	lbs	49,350	13,077	72,476	19,206	112,618	29,844	134,230	35,571
Eggs	doz	65,900	20,363	71,375	22,055	42,742	13,207	25,142	7,769
Milk	CWT	22,183	133,319	25,833	155,256	28,340	170,323	33,290	200,073

1/ Total value for crops and livestock are not additive because significant portions of crops are fed to livestock.
2/ Animal Unit Days

TABLE 9. CURRENT NORMAL AND PROJECTED PRODUCTION AND VALUE OF AGRICULTURAL OUTPUT, SERIES C ALTERNATIVE,[1] MINNESOTA RIVER BASIN

	Units	Current Normal		1980		2000		2020	
		Production	Dollar Value	Production	Dollar Value	Production	Dollar Value	Production	Dollar Value
		(Thousands)							
Crops									
Corn	bu	201,258	303,900	295,199	445,750	380,933	575,209	483,137	729,537
Soybeans	bu	40,464	166,712	71,798	295,808	76,453	314,986	77,570	319,588
Oats	bu	46,603	34,952	45,846	34,385	56,547	42,410	60,262	45,197
Wheat	bu	4,790	11,975	6,275	15,688	8,047	20,118	9,436	23,590
Rye	bu	1,548	1,734	557	624	310	347	-	-
Barley	bu	1,764	2,223	1,252	1,578	1,005	1,266	670	844
Flax	bu	4,050	17,901	2,228	9,848	972	4,296	486	2,148
Hay	T	1,603	40,953	1,600	40,902	1,877	48,414	2,134	54,893
Alfalfa Hay	T	1,448	37,996	1,449	38,021	1,760	46,182	1,980	51,955
Other Hay	T	155	2,957	151	2,881	117	2,232	154	2,938
Silage	T	4,093	39,047	4,175	39,829	4,707	44,904	5,205	49,656
Sugarbeets	T	525	9,970	590	11,204	800	15,192	1,080	20,509
Irish Potatoes	CWT	175	410	245	573	350	819	472	1,104
Vegetables	CWT	5,475	10,402	8,500	16,150	11,930	22,667	16,095	30,580
Pasture	AUD [2]	171,555	61,416	179,682	64,326	188,374	67,438	205,735	73,653
Livestock									
Beef & Veal	lbs	549,000	188,307	768,600	263,629	988,200	338,952	1,235,250	423,691
Pork	lbs	533,250	150,430	639,900	180,516	709,250	200,079	810,540	228,653
Lamb & Mutton	lbs	11,093	3,892	12,313	4,321	14,975	5,255	18,414	6,461
Chickens	lbs	30,250	6,231	16,940	3,489	25,712	5,297	35,998	7,416
Broilers	lbs	1,978	403	1,980	404	4,747	968	7,912	1,614
Turkeys	lbs	49,350	13,077	72,051	19,094	109,557	29,033	163,842	43,418
Eggs	doz	65,900	20,363	59,310	18,326	37,500	11,587	-	-
Milk	CWT	22,183	133,319	23,292	139,984	32,165	193,311	42,148	253,309

1/ Total value of crops and livestock are not additive because a significant portion of crops are fed to livestock.
2/ Animal Unit Days.

routes. At the same time, there will be increased demand for other land uses including agricultural production, recreation, and wildlife habitat. Agricultural land use often generally cannot compete in the market with other uses. The result is decreased agricultural acreage as these other land uses increase.

The additional urban land requirements were derived from population projections and subtracted from the agricultural land inventory. Based on the Series C alternative, an additional 13,000 acres will be required for urban uses by 1980. From 1980 to 2000, an additional 34,400 acres is projected to shift to urban uses and for the period 2000 to 2020, an additional shift of 43,300 acres is projected. Urban and built-up land requirements under the Series E' alternative are projected to increase 21,400 acres by 2000 with an additional increase of 10,000 between 2000 and 2020.

The 1967 and projected major land uses for each alternative are given in Table 10. Agriculture is the primary land use. Projected changes through 2020 will result in a less than one percent decrease in agricultural land.

6. Current Normal and Projected Crop Yields

Current normal and projected crop yields are shown in Table 11. These yield projections were made using long-term trends and the judgment of USDA scientists. The projections assume continued improvements in management and technology. The yield projections also assume continued improvement in conservation and land treatment proportional with past trends.

TABLE 10. PROJECTED MAJOR LAND USES, SERIES C AND SERIES E' ALTERNATIVES, MINNESOTA RIVER BASIN, 1967-2020

		Acres			
		1967	1980	2000	2020
Total Area		10,732,040	10,732,040	10,732,040	10,732,040
Noninventory	Series C	719,590	732,610	767,020	810,320
	Series E'		722,640	741,010	751,020
Cropland	Series C	8,214,190	8,205,210	8,181,450	8,151,550
	Series E'		8,213,390	8,202,810	8,200,270
Pasture	Series C	873,700	872,270	868,490	863,730
	Series E'		873,140	870,760	868,890
Forest	Series C	321,870	320,460	316,760	312,110
	Series E'		320,780	317,580	313,970
Other	Series C	602,690	601,490	598,320	594,330
	Series E'		602,090	599,880	597,890

TABLE 11. CURRENT NORMAL AND PROJECTED PER ACRE CROP YIELDS, MINNESOTA RIVER BASIN

Crop	Units	Current[1] Normal	1980	2000	2020
Corn	bu	83	111	134	154
Silage	T	12	17	20	22
Soybeans	bu	21	27	31	33
Oats	bu	60	78	93	108
Alfalfa Hay	T	3.2	4.1	4.6	5.4
Other Hay	T	0.9	1.2	1.3	1.6
Cropland Pasture	AUD	133	172	198	226
Improved Pasture	AUD	73	96	110	127
Other Pasture	AUD	41	53	61	70
Grazed Forest	AUD	29	42	48	56

[1] Current normal yields are based on 1967 to 1969 weighted average yield across all Soil Resource Groups.

7. Projected Acreage Requirements for Agricultural Production

Benchmark projections reported in Table 12 indicate that the land resources are sufficient to produce the projected Series C agricultural output for the basin, but fall short of producing the projected Series E' output. Projected yield increases and improved technology, coupled with increased efficiency from shifts in crop production between soil types and subareas, are included as a part of the basin's production capacity.

In the current normal period, some 965,000 acres of the basin's cropland were idle.[1] It was assumed that this acreage would be available for future production and is included in the basin's production capacity. By the year 2020, acreage going into urban development out of the cropland base acreage was projected to be, for the Series E' and C respectively, 15,000 and 60,000 acres.

In the Series E' projections, the acreage requirements for meeting corn and soybean production in 2000 would utilize an estimated 81 percent of the cropland base. Soybean acreage would need to double from the current normal acreage of 1,851,500 and corn acreage would have to increase over 25 percent from the current acreage of 2,394,700. Although a reduction in acreage of small grains, silage, hay, and pasture are estimated, this is not sufficient to provide the additional capacity needed to produce the Series E' projected levels of crop production.

[1] This acreage includes land idle for conservation purposes, temporarily idle land, and open land formerly cropped, as reported in the 1967 Conservation Needs Inventory.

TABLE 12. CURRENT AND PROJECTED ACREAGES OF MAJOR CROPS AND PASTURE USE, SERIES C AND SERIES E' ALTERNATIVES, MINNESOTA RIVER BASIN

Crop	Current Normal	1980		2000		2020	
		Series C	Series E'	Series C	Series E'	Series C	Series E'
	(Thousand Acres)						
Corn	2,394.7	2,668.9	2,577.5	2,854.0	3,026.9	3,136.1	2,969.4
Silage	323.5	251.1	254.6	235.3	239.4	234.9	230.1
Soybeans	1,851.5	2,707.9	3,128.7	2,473.9	3,670.2	2,330.5	3,678.9
Oats	786.1	588.0	565.7	605.4	713.1	560.6	721.2
Other Small Grains[1]	512.7	431.2	410.7	383.5	361.4	383.5	343.2
Speciality Crops[2]	108.4	108.4	120.5	108.4	106.4	108.4	91.5
Alfalfa	454.1	351.6	357.8	379.2	385.0	365.3	360.7
Other Hay	143.0	123.2	127.5	87.2	91.5	95.8	95.0
Cropland Pasture	674.4	572.2	474.1	523.5	527.0	480.9	484.4
Idle Land	965.9	402.5	196.3	531.1	3/	455.6	4/
Improved Pasture	604.8	606.1	606.1	622.9	622.9	622.5	622.5
Permanent Pasture	268.9	266.2	266.2	245.5	245.5	241.1	241.1
Grazed Forest	165.3	86.5	86.5	51.5	51.5	27.4	27.4

[1]Includes wheat, rye, barley and flax.
[2]Includes sugarbeets, potatoes, vegetables, orchards, etc.
[3]Projected crop acreages exceed cropland base by 918,100 acres.
[4]Projected crop acreages exceed cropland base by 774,100 acres.

The Series C outputs are estimated to use approximately 95 percent of the cropland base throughout the projection period. This level of utilization represents nearly full capacity at the current state of land and water resource development. The higher levels of output as projected in the Series E' alternative cannot be produced without extensive resource development, greater yield increase than assumed, shifts in production between subareas, or a combination thereof.

CHAPTER III

Resource Problems

Problems discussed in this chapter were determined through meetings, interviews, and discussions held throughout the basin with local people, policy committees, and USDA technical field personnel. This chapter is a summary of the problems discussed in the Commission report. Please refer to Chapter IV of the Commission report for information on the extent of these problems.

A. Soil Erosion

The significant erosion problems in the basin are wind and water erosion. Of these, sheet and rill erosion caused by water runoff is of greatest significance. It is estimated that 3,389,200 acres (82%) of land with this erosion hazard are utilized as cropland. See Table 13.

TABLE 13. INVENTORY OF AGRICULTURAL LAND WITH EROSION HAZARDS BY CLASS-SUBCLASS[1], MINNESOTA RIVER BASIN

Item	IIe	IIIe	IVe	VIe	VIIe	Total
			(Thousand Acres)			
Cropland	2,501.9	680.3	146.8	50.4	9.8	3,389.2
Pasture	111.2	88.7	74.7	68.0	37.2	379.8
Forest	51.4	19.9	20.8	23.4	76.8	192.3
Other	137.5	33.5	9.4	7.9	8.5	196.8
TOTAL	2,802.0	822.4	251.7	149.7	132.3	4,158.1

[1] From 1967 Conservation Needs Inventory.

Gully, streambank, shoreline, and roadside erosion, as well as erosion occurring on construction sites, agricultural lands, and in urban areas are problems of varying degree.

B. Sedimentation

Sedimentation is also a problem in the Minnesota River Basin. The major source of sediment is erosion on cropland. Other types of upland erosion, such as gullying and roadside erosion, are locally severe but do not constitute a significant source of sediment pollution.

Streambank erosion occurs principally during flood flows. About 200 miles of streambank, within watersheds 400 square miles or less, are affected by erosion, but damage is considered severe on about 30 miles. It is estimated that approximately 7 acres per year are destroyed as a result of this erosion.

C. Floodwater

Flooding is one of the primary problems in the tributary area of Study Areas I, II, and along much of the main stem of the Minnesota River. Flooding occurs on 28,000, 302,000 and 195,000 acres respectively.

Flooding in Study Area II alone causes average annual damages in excess of $5.7 million. Average annual floodwater damage along the Minnesota River is more than $5,000,000. (See Table 14 for flood damages that occur in Area II; also refer to Chapter IV of the Commission report for other flood damage.)

TABLE 14. AVERAGE ANNUAL FLOOD DAMAGE (DOLLARS), MINNESOTA RIVER BASIN

Subbasin	Crop and Pasture	Other Agricultural	Road and Bridge	Urban	Indirect	Total
Yellow Bank	$ 160,900	$ 18,800	$ 15,700	$ 300	$ 20,300	$ 216,000
Lac qui Parle	1,253,800	155,400	35,300	9,100	147,400	1,601,000
Yellow Medicine	1,491,300	163,400	27,800	5,700	170,800	1,859,000
Redwood	708,000	81,900	20,600	7,700[1]	82,800	901,000
Big Cottonwood	979,500	59,300	12,800	11,200	107,200	1,170,000
TOTAL	$4,593,500	$ 478,800	$112,200	$34,000	$528,500	$5,747,000
Percent of Total Damage	80%	8%	2%	1%	9%	100%

[1] This report assumed no urban damages in Marshall, Minnesota, because of the Corps of Engineers flood control project.

D. Inadequate Drainage

Agricultural drainage problems are caused by excess surface and/or subsurface water. Problems exist primarily where the natural stream pattern is undeveloped. In many problem areas, surface and subsurface drainage systems are interdependent.

Table 15 shows an inventory of agricultural land with wet soils or excessive water.

TABLE 15. INVENTORY OF AGRICULTURAL LAND WITH EXCESS WATER PROBLEMS BY CLASS-SUBCLASS[1], MINNESOTA RIVER BASIN

Thousand Acres

Item	Land Classification IIw	IIIw	IVw	Vw	VIw	VIIIw	Total
Cropland	2,662.6	712.8	5.0	5.1	25.0	5.0	3,415.5
Pasture	161.4	133.3	6.1	21.5	67.0	6.1	395.4
Forest	35.8	8.3	0.6	7.6	45.7	2.1	100.2
Other	74.5	96.0	9.6	6.9	28.0	99.6	314.6
TOTAL	2,934.3	950.4	21.3	41.1	165.7	112.8	4,225.7

[1] From 1967 Conservation

Not all areas having an excess wetness problem are in need of drainage since drainage needs are dependent on the desired use of the areas.

E. Water Supply

The study questionnaires indicated that no significant water supply problems exist in the basin. Some of the 58 communities surveyed by the Department of Economic Development did note inadequate facilities and distribution systems. The peak water demand equals or exceeds pumping capacity in only a few communities.

In general, no municipal water supply shortages exist and few are anticipated with projected growth.

The demand the agricultural industry has placed on the basin water supply in the past has not been significant. However, the projected demand of 460 mgd for irrigation water by 2020 is significant, and additional ground water studies must be completed before an accurate assessment can be made. Other factors that will determine the future of irrigation in the basin are: (1) the overall farm price-cost situation; (2) the availability of appropriate financing to support irrigation development; (3) the availability of energy and its relative cost; (4) the type of state or federal legislation enacted for water, land, and energy use; (5) short or long term shortages of materials or equipment in the irrigation industry; and (6) the support given irrigation development through research, educational programs, and market development.

F. Forest Land

The major problem affecting forest land is the lack of proper management. Because of this neglect, disease, fire, and grazing have become specific problems in certain areas. Lack of a market is a basin-wide problem.

Dutch elm disease is the most serious threat to the basin's forest resource, which is 39 percent elm. By the year 2000, essentially all the existing elm trees will be gone; the residual stand will be limited to those less than 6 inches in diameter, where natural immunity is active.

Fire is also a problem affecting the forest, though its impact is not as severe as that of dutch elm disease. Approximately fifty fires occur each year, causing a total burn of 3,000 acres annually.

Grazing of forest land is widespread and a problem because it impairs the growth potential of the trees. The animals harm the site by causing severe soil compaction and by disturbing the soil's protective litter cover. As a result, infiltration and percolation rates decrease, runoff and erosion volumes increase, nutrients are lost, and site productivity declines.

G. Pollution

Major pollution sources in the basin are soil erosion, feedlot runoff, and municipal and industrial waste.

Soils throughout the basin are fertile and many of these soils are susceptible to water and wind erosion. Sediment, the product of erosion, carries with it nitrogen and phosphorus, which contribute to the eutrophication of lakes and the degradation of streams and rivers.

Municipal waste is also a problem relating to pollution. Problems related to municipal waste are water and air pollution. The Minnesota Pollution Control Agency has determined that, of the 133 communities in the Minnesota River Basin; 29 currently provide adequate sewage treatment, 25 are expected to be able to provide adequate treatment by making various operational or maintenance improvement on the existing facilities, 60 must upgrade or replace their current facilities, and 19 currently have no facilities other than private septic tanks.

Although total livestock numbers have not changed significantly, new technology and management practices have led to significant changes in their concentration. The general trend towards larger and more concentrated feeding areas has resulted in growing concern as to the environmental effects on surrounding areas and water resources.

There are approximately 376 livestock waste control structures in the basin. Of these, 97 were installed during 1975 at an average cost of $7,100. These systems consist of one or more of the following components: holding pond, earth storage facility, clean water diversion, polluted water diversion, lagoon, concrete tank, settling basin, and concrete

storage facility (stacking). The systems installed during 1975 consisted of 151 components - 1.6 components per system. Financial assistance for the installation of a system is available from ASCS, who can pay up to 50 percent of the cost not to exceed $2,500 for one farm or up to $10,000 for a watershed-wide program. In some counties the cost-sharing may be up to 80 percent.

H. Fish and Wildlife

Major wildlife problems in the basin are the continued loss of habitat to other land uses, and the deteriorating quality of remaining habitat. These problems result from increased demand for land and water resources, primarily for increased agricultural production and urban expansion.

The basin's fishing waters share two common problems - pollution and rough fish invasion. Removal of shoreline and streambank vegetation by grazing, development, and other causes has not only created erosion problems, but has reduced spawning habitat and protective shaded areas. Carp and other undesirable rough fish are common throughout the basin.

I. Recreation

The demand for outdoor recreation opportunities has steadily increased in the past two decades. Changes in economic conditions, population, leisure time, and user attitudes are major reasons.

Most water and land based recreation facilities are deficient and represent important priorities for additional development. Table IV-15 of the Commission report shows the deficiency of various outdoor recreation facilities.

J. Aesthetic Values

Residents of the basin are concerned about the aesthetic value of the basin and have made efforts to preserve and develop areas and features that have aesthetic value. This concern results from recognition of the general deterioration in visual, historical, and archeological resources.

K. Land Use

Land use problems identified in the basin are:

1) Conflicts between development and preservation of natural areas.
2) Loss of agricultural land to residential, commercial, and industrial development.
3) High cost of providing services for unguided urban growth.
4) Adverse environmental impacts of building on unsuitable land.
5) Potential effects of higher energy cost on type and distribution of future urban/rural areas.
6) Erosion and sediment from developing areas.

CHAPTER IV

Recommendations Affecting USDA

Chapter VIII of the Commission Report - The Basin Plan - contains a variety of recommendations for solving the resource problems identified in the basin. In developing this plan, the Commission recommended many of the projects investigated by the SCS River Basin Planning Staff, projects of the Corps of Engineers, recommendations and programs of the Forest Service, and State programs. They also identified the need for new legislation to provide other means for solving problems in the basin.

Of particular concern in this USDA Report are USDA measures recommended by the SMRBC. Chapter VII of the Commission report lists the alternatives that USDA investigated for solving some of the identified problems. These alternatives were divided into two categories, structural and non-structural.

A. Non-Structural Measures

1. No Project

Past and present trends clearly show that development in the basin will continue even if no Federally-assisted projects are initiated. Additional wetland will be drained and channels will be enlarged or constructed where it proves to be economically feasible. It is possible that these activities will occur in areas that have planned projects, but adverse effects of these activities can be minimized when they are included in a total resource plan.

The history of the basin's development indicates that several features of resource development will continue in spite of what is proposed here. Channel alteration work will continue to be done, but it is unlikely that extra expense will be incurred to minimize adverse effects on the environment. Very little, if any, capital from private sources has ever been expended for measures to reduce adverse environmental effects of such work. Because of Federal regulations, constructive action designed to mitigate the undesirable effects of resource development could be expected under a public-funded project.

2. Environmental Corridor

The environmental corridor is a concept of resource preservation through which land, water, recreation areas, historical sites, towns, and other areas can be protected.

Through the corridor system, streams and lakes can be enhanced by limiting or restricting development, land treatment practices can be implemented to reduce erosion, favorable wildlife habitat and unique areas can be created and preserved. Corridors can also help solve problems of flood damage, water pollution, erosion and sedimentation, as well as providing additional recreational activities.

Chapter VII of the Commission report contains maps and tables locating potential environmental corridor areas.

3. Accelerated Conservation Land Treatment

A program to accelerate the rate of application of conservation land treatment measures will provide runoff reduction, sediment control, and water management benefits. The effectiveness of land treatment measures in reducing runoff, erosion, and sedimentation make it imperative that they be included as an integral part of all resource conservation projects. Major benefits attributed to land treatment are the reduction of soil loss from erosion and reduction of sediment that enters streams. Reduced flooding resulting from installation of land treatment measures is minor.

B. Structural Measures

Structural measures may be constructed for purposes of flood water retardation, recreation, land stabilization, or to provide for drainage. A combination of structural and nonstructural measures were evaluated to determine solutions in specific problem areas identified by the policy committees and the local people. Following are brief summaries of those investigations.

1. South Fork Watonwan River - Study Area I

Major problems identified are erosion and sedimentation, flooding, lack of recreational opportunities, and insufficient depth in School and Irish Lakes to support desirable fish populations.

To solve the problem of sediment and erosion, an accelerated land treatment program is recommended.

To solve the flooding problem, two floodwater retarding structures are recommended - one on the South Fork Watonwan River and one on the Bingham Lake Branch. Average annual benefits expected to accure from these two structures are $80,905. Annual cost is estimated to be $65,890. The benefit cost ratio is 1.2:1.

No feasible solutions could be developed for recreation on School Lake, Irish Lake, or the proposed floodwater retarding structures. A local proposal is the acquisition and development, for public use, of the wooded valley along the lower reaches of the South Fork Watonwan River. It could be maintained in its natural state or developed for recreation.

Application has been made by the sponsoring organization for a PL-566 project on the South Fork Watonwan River. It has been recommended that the sponsors continue to seek assistance from the Soil Conservation Service through PL-566.

2. Upper Minnesota River Subbasin - Study Area II

Major problems identified in this area are flooding and impaired drainage on 300,000 acres. Other associated problems are pollution, erosion, and sedimentation.

To solve these problems, three alternatives were considered. The alternative selected for solving these problems was a structural program of 81 floodwater retarding structures and ten miles of levees. These structures would provide annual flood damage reduction benefits of $4,738,800. The annual cost would be $3,296,500.

The Commission has recommended that a joint study by the Department of the Army and the Department of Agriculture, authorized by Congress under PL 87-639, be used to help solve some of the problems in Study Area II.

3. Pomme de Terre River - Study Area III

Identified problems are flooding, impaired drainage, sedimentation and erosion, and associated problems of road and bridge damage.

To solve these problems, the following five alternatives were considered:

a) A series of floodwater retarding structures - Significant flood prevention from this alternative does not appear feasible. The tributary flood plains are narrow and provide little storage. The main Pomme de Terre would still have a large uncontrolled drainage area contributing to peak flows so that little damage reduction would be attained.

b) A dam upstream from Appleton on the Pomme de Terre Main stem -

This alternative would practically eliminate flooding on the Pomme de Terre River downstream from the dam and would reduce sediment yield into Marsh Lake. However, the project at this time is economically unfeasible. The dam would inundate the flood plain for approximately 10

miles upstream and would have adverse environmental impacts.

c) Channel improvement consisting mainly of clearing and snagging - This alternative would be economically feasible in a few select reaches, but would have little overall effect on the major problems.

d) Levees along the main stem in Swift County - Field examination indicated agricultural flooding problems on 1,350 acres along a 7 mile reach of river in Moyer Township, Swift County. Leveeing of the entire reach does not appear feasible, since providing sufficient flow capacity within the levees would require most of the 1,350 acres that are to be protected. Some localized levees on parts of the area may be feasible; however, soil stability with high stages and long duration of flow would be a problem.

e) Land treatment to control wind and water erosion. A land treatment program to control erosion is feasible; however, it would do very little to solve the flooding problem.

Cost and benefit information is not available for these alternatives. It has been recommended by the Commission that assistance be sought through the Resource Conservation and Development Program.

4. Holloway Creek - Study Area III

Major problems in this watershed are wet agricultural land and the lack of adequate outlets for drainage, flooding of agricultural land along the main channel and primary tributaries, flood damage to roads and bridges, and erosion damage.

A limited channel improvement project with associated measures designed to improve wildlife habitat, accelerated land treatment measures, and a conservation cropping system to minimize erosion and sedimentation are proposed. This proposed channel would basically follow the present channel alignment. This alternative is economically feasible and would reduce adverse effects on the wildlife habitat. Average annual costs for this proposal are estimated to be $69,100. Annual benefits derived are: $95,000 from reduction of crop and pasture damages, $16,000 from reduction of other agricultural damages, $2,600 for reduction of road and bridge damages, and $11,400 from indirect damages. The benefit cost ratio realized is 1.8:1.

It has been recommended to the local sponsors that they seek further assistance through the Resource Conservation and Development Program.

CHAPTER V

Objectives and Component Needs

This United States Department of Agriculture Summary Report was developed using the study procedures consistent with the Water Resources Council's Principles and Standards for Planning Water and Related Land Resources. The Principles and Standards specify that the overall purpose of water and land resource planning will be directed toward improvement in the quality of life through contributions to the objectives of national economic development (NED) and environmental quality (EQ).

Components of the NED objective are those that will enhance national economic development by increasing the value of the nation's output of goods and services and improving national economic efficiency.

The environmental quality objective is enhanced by the management, conservation, preservation, creation, restoration, and improvement of the quality of natural and cultural resources and ecological systems.

Economic development and improving and maintaining a quality environment were goals of those involved throughout the planning process. Therefore, the planning process was consistent with the requirements of the Principles and Standards.

A. National Economic Development Objective

Component needs identified with the NED objective are in four general categories:

1) Flood damage reduction on urban and rural land

2) Agricultural water management to improve production on agricultural land

3) Provision for additional outdoor recreation opportunities

Elements assigned to the NED objective to help satisfy the identified component needs are:

1) Two floodwater retarding structures in the South Fork Watonwan River Watershed.

2) Eighty-one floodwater retarding structures and ten miles of levees in Study Area II.

3) Channel work, clearing and snagging on the Pomme de Terre River.

4) Channel work on Holloway Creek.

5) Agricultural water management on some of the wet soils suitable for crop production throughout the basin.

6) Accelerated land treatment program to include installation of conservation measures to reduce erosion and sedimentation throughout the basin.

7) Use of the environmental corridor system and floodwater retarding structures to provide additional recreation opportunities to help satisfy present and future demands.

8) Increased hunting and fishing opportunities by including provisions for fish and wildlife habitat.

B. Environmental Quality Objective

Component needs identified with the EQ objective are in three general categories:

1) Accelerated rate of application of land treatment measures on erosive lands
2) Protection and management of areas with environmental, ecological, biological, and aesthetic value
3) Improvement of water quality

Elements assigned to the EQ objective to help satisfy the identified component needs are:

1) Establishment of an accelerated land treatment program to install conservation measures that will reduce erosion and sedimentation and improve water quality
2) Use of environmental corridor system to protect scenic and unique areas

The following table shows the quantitative effects of USDA actions on solving component needs. Detailed information is not available for all elements of these projects; however, should local sponsors choose to pursue any of these projects through Federal assistance, they will be developed using the requirements of the Water Resource Council's Principles and Standards for Planning.

C. CAPABILITY OF USDA ACTION TO SATISFY COMPONENT NEEDS

Minnesota River Basin

Description	Unit	Component Need Quantity	USDA Plan Components Provide	Remaining	USDA Program
Flood Damage Reduction	AC.	585,100	170,380	414,720	PL-566, RC&D, PL-639
Conservation Land Treatment[6/]	AC.	4,649,000[1/]	904,000[2/]	3,745,000	PL-46, ACP, PL-566
Erosion Reduction	Ton/yr.	31,905,000[3/]	2,021,000	29,884,000[4/]	PL-46, ACP
Recreation	Activity Occasions	1,058,020	Unknown[5/]	Unknown	(Environmental Corridors) RC&D, PL-566, PL-639

1/ Acres needing treatment in 1974.
2/ Acres adequately treated in 1985.
3/ Soil loss in 1974.
4/ Soil loss in 1985.
5/ Potential for the USDA Plan to satisfy recreation needs was not evaluated.
6/ Includes land treatment and drainage on cropland, pasture, forest land, and other land.

D. Environmental Assessment Summary

Chapters II and III of this summary and Chapters II, IV, and V of the Commission report assess the current land and water resources of the basin, outline the problems and needs, and discuss potential for meeting future resource needs. More detailed information concerning the present and future environmental quality of the Minnesota River Basin is contained in those chapters.

The following Environmental Assessment Summary discusses the impacts associated with implementation of the Southern Minnesota River Basin Commission's recommendations which affect USDA programs and projects as presented in Chapter IV of this summary report.

1. Environmental Impacts

The accelerated land treatment program on 826,000 acres of cropland, 64,000 acres of pastureland, 8,000 acres of forest land and 6,000 acres of other land would reduce soil loss in the basin by over 2 million tons annually and increase land adequately treated by 904,000 acres by 1985. The resulting reduction in erosion, sedimentation, and nutrient and pesticide levels would improve water quality and stream habitat for fish. Improvements in wildlife habitat quality, scenic beauty, pasture and forest production, and overall environmental quality would also result.

Installation of the 83 impoundments would reduce flood damages, change stream flow regimes, trap sediment and nutrients, and inundate cropland,

pastureland, forestland, other land, and segments of streams. Terrestrial wildlife habitat and stream fish habitat would be destroyed and replaced by wetland and aquatic habitat for waterfowl and lake fish. New water based recreation opportunities would be created. Landscape diversity would be increased. Dust, noise, erosion, and sedimentation would increase during construction. Traffic, noise, litter, and human disturbance would increase at recreation developments. The influx of more people to recreational developments will create a need for more public services such as police and fire protection, waste disposal, medical services, etc. Water temperatures would increase downstream from the reservoirs during summer months. Turbidity and sedimentation would be reduced. Some fish and wildlife would be destroyed or displaced during construction and by inundation. Benthic ecosystems would be altered and stream habitat for warm water fish would be improved downstream of the impoundments. Fish movements would be blocked or restricted.

Where environmental corridors are implemented, landscape diversity and scenic beauty would be enhanced. Woodlands, wetlands, wildlife habitat, and natural streams would be preserved and protected. Riparian ecosystems would be preserved and improved. Some cropland and pastureland would be converted to natural vegetation and wildlife habitat. The scenic buffer would provide increased recreation opportunities, a vegetative filter for improved water quality, and reduced flood damages from less intensive use of the flood plain. Benefits of intensive use of the corridor for crop production would be foregone.

Installation of channel improvements and levees would alter or disturb

approximately 22 miles of intermittent and perennial streams due to construction activities. Additional miles would be disturbed due to clearing and snagging operations. Flood damages would be reduced and drainage conditions improved. Stream hydrology, natural characteristics, and benthic ecosystems would be altered. Wildlife habitat, cropland, pasture-land, forestland, and other land would be converted to channels, spoil banks, and levees. Dust, noise, erosion, and sedimentation would increase during construction. Landscape scenic quality would be reduced. Agricultural production potential would increase. Conversion to more intensive land use would be induced in the benefited area.

USDA implementation of project actions would provide for surveys which would lead to preservation and recovery of important cultural resources and replace, compensate, or mitigate project induced losses of fish and wildlife habitat or other significant environmental resources.

2. Unavoidable Adverse Environmental Effects

Lands required for structural measures would be permanently lost as terrestrial wildlife habitat, and would result in the concentration of present species in remaining habitat acres of the basin. Some fish and wildlife would be lost during construction activities and by inundation. Traffic, noise, litter, and human disturbance would be increased at recreation developments. Dust, noise, erosion, and sedimentation would increase during construction. Installation of reservoirs would restrict the movement of fish. Stream water temperatures in summer would be increased, and benthic ecosystems would be altered. Natural stream characteristics would be

lost along approximately 22 miles of intermittent and perennial streams by channel and levee construction. Stream segments inundated by reservoirs would be permanently lost as stream fish habitat. Woodland, open land, and riparian and stream ecosystems would be altered, disturbed, or lost.

3. Alternatives

Alternatives to reduce or eliminate adverse environmental impacts of project actions generally fall into the following categories: (1) no project action (2) non-structural flood plain measures (3) other structural measures. Chapter IV of this summary and Chapters V and VII of the Commission report discuss various alternative for solving identified problems in the basin.

The option of no action is always available at potential impoundment sites and channel improvement reaches. Reduced numbers or sizes of impoundments may reduce environmental damages with a corresponding reduction of flood protection benefits. Flood plain zoning, flood plain acquisition, and flood-proofing are alternatives to impoundments and channel improvement on a site-location basis at local option. Adoption of environmental corridors is a recommended alternative by the commission that not only eliminates adverse environmental impacts of structural measures, but also improves the environmental quality of the area and increases recreation opportunities.

4. Short-Term vs Long-Term Use of Resources

The Minnesota River Basin economy is based on the production of

agricultural products. Agriculture accounts for over 32 percent of all earnings and over 20 percent of the labor force. Over 83 percent of the land in the basin is devoted to agriculture. With agriculture holding such a dominant position in the basin economy, much of the remaining economic activity is related to this agricultural production or marketing.

Opportunities for development in the basin are determined by the basin's natural resources, environment, and existing and future economic conditions. Continued economic growth and higher levels of living are goals of resource planning.

It is anticipated that some water and related land resource development will occur in the basin in the absence of a federally assisted plan. The history of the basin's development indicates that several features of resource development which many people consider undersirable will continue in spite of what is proposed here.

The plan for the Minnesota River Basin was developed using environmentally and economically feasible alternatives. No changes in land use are proposed or anticipated that will significantly restrict options for future use or productivity. The proposed 83 reservoirs will commit some cropland, pastureland, forestland, other land, and stream segments to levees, reservoir pools, dams and spillways. The environmental corridors will commit lands to a variety of uses. Redistribution of labor and capital and the committment of fuel will occur during project construction. Other temporary adverse effects will occur during project construction

which are mentioned in other sections of this environmental assessment.

Many of the plan components were recommended to maintain long term productivity of the basin's resources. This is evident in the land treatment program recommended to maintain productivity of the soils, and reservoirs which will reduce flooding and allow for more intensive use of land. Measures are also recommended that will maintain, preserve, or mitigate elements of the biological community.

It can be concluded that the measures and projects recommended for the basin will not present serious conflicts between local short-term use of man's environment and the maintenance and enhancement of long-term productivity.

5. Irreversible or Irretrievable Commitments of Resources

Thirteen thousand acres of cropland, pastureland, forest land, wildlife and other land, and segments of streams which would be required for recreation facilities, reservoir pools, dams, spillways, channels, and levees would be irreversibly lost from those land uses. Conversions to environmental corridors would commit the areas to mainly environmental uses, but would preserve future options for land use changes in those areas. Agricultural and wildlife production would be irretrievably lost on lands required for structural measures. Labor, fuel, and capital would be required to construct and install the project measures, and thus, irretrievably diverted from other activities. The present landscape would be permanently and irreversibly altered.

CHAPTER VI

ACCOUNTS DISPLAY FOR SELECTED PLAN

National Economic Development Account

Environmental Quality Account

Regional Development Account

Social Well-Being Account

SELECTED PLAN

National Economic Development Account

Minnesota River Basin

Components	Measure of Effects	Components	Measure of Effects
Beneficial Effects	(Average Annual Dollars 2/	Adverse Effects	(Average Annual Dollars) 1/
A. Value to users of increased goods & services.		A. Value of resources required for project implementation.	
1. Flood Prevention	4,458,200	1. Floodwater retarding structures, channels & levees	
2. Agricultural water management	495,400 3/	Project installation	3,000,300
		Operation & Maintenance	140,500
		2. Project administration	346,600
		Total Adverse Affects	3,487,400
Total Beneficial Effects	4,953,600		
		Net Beneficial Effect	$1,466,200

NOTE: Land Treatment bemeficial effects were not evaluated. Cost for accelerated land treatment is $77,798,000. This cost is for treatment applied by 1985.

1/ 50 years @ 6 3/8 percent interest.

2/ Price base: Current normalized prices - (October 1976) - for cropland and pasture; 1977 prices for all others.

3/ Benefits allocated to drainage as a result of installing flood prevention measures.

SELECTED PLAN

Environmental Quality Account

Minnesota River Basin

Components	Measures of Effects
A. Areas of Natural Beauty	1. The accelerated land treatment program will enhance the physical appearance of 826,000 acres of cropland, 64,000 acres of pasture, and 8,000 acres of forest land by 1985.
	2. Create 83 impoundments which include 27 impoundments with fish, and wildlife potential of 1,888 total surface acres.
	3. Inundate 13,000 acres of meadows, pasture, forest land, and other natural areas; and approximately 22 miles of streams. This includes approximately 7,000 acres of prime farmland.1/
	4. Alter and/or disturb approximately 22 miles of intermittent and perennial streams due to levees, channel construction, and clearing and snagging.

1/ Since mapping of prime farmland has not been completed, this figure is only an estimate.

SELECTED PLAN

Environmental Quality Account

Components	Measures of Effects
A. (Continued)	5. Enhance landscape diversity and scenic beauty by the establishment of environmental corridors.
	6. Reduce sediment deposition in wetlands as a result of land treatment.
B. Quality Considerations of Water, Land, and Air Resources	1. Reduce soil loss in the basin by over 2 million tons annually by 1985.
	2. Land treatment measures will protect 904,000 acres from erosion and wetness problems.
	3. Land treatment measures will improve the vegetative quality of 64,000 acres of pasture and 8,000 acres of forest land through the accelerated land treatment program and better management of the natural resources.

SELECTED PLAN

Environmental Quality Account

Components	Measures of Effects
B. (Continued)	4. Conversion of agricultural land in the basin to land required for channel work and other structures.
	5. Increase dust, noise, ercsion, and sedimentation during project installation.
	6. Increase traffic, noise, litter, and human disturbance at impoundments with recreation developments.
	7. Reduce nutrient (N,P,&K) levels in surface runoff waters.
	8. Reduce turbidity and sedimentation in the basin's rivers and streams.

SELECTED PLAN

Environmental Quality Account

Components	Measures of Effect
B. (Continued)	9. Increase stream temperatures during summer months downstream from some reservoirs.
	10. Concentrate nutrients and trap sediments in reservoirs.
	11. Alter the hydrology and natural characteristics of approximately 22 miles of intermittent and perennial streams due to levees and channel construction.
	12. Increase ground water recharge.
	13. Preserve and protect forest lands and wetlands especially those within environmental corridors.
C. Archeological, Historical and Geological Resources	1. Preserve unique and important cultural sites in environmental corridors.

SELECTED PLAN

Environmental Quality Account

Components	Measures of Effect
C. (Continued)	2. Provide for surveys, preservation, or recovery of important cultural resources before construction of any USDA projects.
D. Biological Resources and Selected Ecosystems	1. Inundate upland, wetland, and forest land wildlife habitat at 83 impoundments, and alter or disturb habitat along approximately 22 miles of stream by levee and channel construction.
	2. Create 83 new water bodies for use by waterfowl and shore birds.
	3. Create 18 reservoirs (1,888 acres) with potential for lake fisheries.
	4. Create 9 shallow impoundments with potential for management as wetland wildlife habitat.
	5. Convert upland and forest land wildlife habitat to recreational land use at impoundments with recreation developments.

SELECTED PLAN

Environmental Quality Account

Components	Measures of Effect
D. (Continued)	6. Increase the potential for human harassment of wildlife species in areas of recreation development.
	7. Destroy or displace wildlife during construction and by inundation.
	8. Preserve and improve wildlife habitat and riparian ecosystems where environmental corridors are implemented.
	9. Create a number of impoundments with sufficient nutrient loading to produce nuisance algae blooms.
	10. Improve the wildlife habitat quality of 64,000 acres of pasture and 8,000 acres of forest land by accelerating the application of land treatment and management practices.

SELECTED PLAN

Environmental Quality Account

Components	Measures of Effect
D. (Continued)	11. Inundate perennial stream fishery habitat at some of the 83 impoundment sites.
	12. Alter benthic ecosystems downstream of reservoirs and in channel construction areas of streams.
	13. Improve stream habitat for fish by reducing turbidities, biocides, and sediments entering basin streams.
	14. Increase the potential for fly and mosquito production.
	15. Convert cropland and pastureland to natural vegetation and wildlife habitat where environmental corridors are implemented.
	16. Interfere with movements of fish in streams.

SELECTED PLAN

Environmental Quality Account

Components	Measures of Effect
E. Irreversible Commitments of Resources	1. Conversion of cropland, pastureland, forest land, other land, and stream segments to channels, levees, reservoir pools, dams, and spillways at 83 impoundment sites.
	2. Diversion of labor, fuel, and capital from other activities to construct and install the project measures.

SELECTED PLAN

Regional Development Account

Minnesota River Basin

Components	Measures of Effects	
	State of Minnesota	Rest of Nation
Income:	(Average Annual Dollars)1/	
Beneficial effects		
A. The value of increased output of goods and services to users residing in the region.		
1. Flood Prevention	4,458,200	0
2. Agricultural Water Management	495,400	0
B. The value of output to users residing within the region from pecuniary external economics.	536,000	0
Total Beneficial Effects	5,489,600	0

Components	Measures of Effects	
	State of Minnesota	Rest of Nation
Income:	(Average Annual Dollars)1/	
Adverse effects		
A. The value of resources contributed from within the region to achieve the outputs.		
1. Construction of measures to prevent flooding and provide for agricultural water management.1/		
Project Installation Cost	626,300	2,374,000
Project Administration	86,700	260,000
Project O & M	140,400	-
Total Adverse Effects	853,400	2,634,000
Net Beneficial Effects	4,636,200	-2,634,000

1/ 6 3/8% interest for 50 years.
Price base: Current normalized prices (October 1976) for agricultural production. 1977 prices for all other.

SELECTED PLAN

Regional Development Account

Component	Measure of Effect	
	State of Minnesota	Rest of Nation
Employment		
Beneficial effects:		
A. Increase in numbers and types of jobs.		
1. Employment for project construction.	902 man-years of skilled labor; 258 man-years of semi-skilled labor; 120 man-years of common labor.	
B. Employment for engineering and project administration.	382 man-years of skilled labor; 4 man-years of semi-skilled labor; 29 man-years common labor.	
C. Employment for operation and maintenance of projects.	10.5 common labor jobs per year for 50 years.	
D. Increase in number of jobs in the agriculture and recreation sector were not evaluated.		

SELECTED PLAN

Regional Development Account

(Continued)

Component	Measure of Effects	
	State of Minnesota	Rest of Nation
Net Beneficial Effect.	1284 man-years of skilled labor.	
	262 man-years semi-skilled labor.	
	149 man-years of common labor.	
	10.5 common labor jobs per year for O & M.	

SELECTED PLAN

Social Well-Being Account

Minnesota River Basin

Components	Measure of Effects
Beneficial and adverse effects.	
A. Real Income Distribution	1. Create 1,284 man-years of skilled labor; 262 man-years of semi-skilled labor; 149 man-years of common labor; 10.5 common labor jobs per year for O & M.
	2. Put $39,436,700 into the regional economy for the construction of proposed projects, engineering service and project administration.
	3. Create regional income benefits of $5,489,600.
	4. Provide an undetermined number of jobs through the installation of proposed recreation measures.
B. Life, Health and Safety	1. Improve water quality. Provide for a 2-5 year frequency level of flood protection.
	2. Require swimming safety measures.

SELECTED PLAN

Social Well-Being Account

Components	Measure of Effects
C. Educational, Cultural, and Recreational.	1. Increase fish and wildlife population for fishing and hunting opportunities.
	2. Provide an increased number of recreation visits.
	3. Provide outdoor study opportunities through the environmental corridor system.
	4. Reduce the area available for hunting big game and upland game birds and increase, by a similar amount, the area available for waterfowl hunting at the 83 impoundment sites.